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When Preparing Patients for Surgery Is the Friction (Back and Forth) Method of Scrubbing the Skin More Effective Than Concentric Circles at Reducing Bacterial Levels on the Skin?

A Knowledge Summary by

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KNOWLEDGE SUMMARY

PICO question:

In veterinary patients is the friction (back and forth) method of scrubbing the skin more effective than concentric circles at reducing bacterial levels on the skin?

Clinical bottom line:

Currently there is insufficient evidence to indicate whether the friction (back and forth) method of scrubbing the skin is more effective than the concentric circle method at reducing bacterial levels on the skin.

Clinical Scenario

A student veterinary nurse is preparing a bitch spay for surgery and asks what is the best method for preparing the surgical site as they had seen in some literature that the friction (or back and forth) method may be better than the more traditional circular method.

Historically veterinary patients undergoing surgery have been prepared for surgery by applying scrub solutions on a swab in a circular motion, working from the surgical site outwards towards the periphery before repeating until the skin is clean. The performance of this method has been questioned in recent years with people claiming that the circular method means that the actual surgical site doesn't get adequately disinfected or that the circular motion risks bringing bacteria from the periphery back to the surgical site. Another method has been suggested to be superior to this; the friction method involves a short back and forth, side to side motion of scrubbing which starts over the proposed surgical site and works outwards, discarding the swab once the periphery is reached. By looking into the evidence the author hopes that the results will help in educating both students and qualified veterinary nurses on the gold standard of patient preparation.

The Evidence

Two studies were found which could be used in this Knowledge Summary, one human and one veterinary. The human study refers to donor arm disinfection so there are stark differences in the surfaces and the size of areas being prepared, in this instance the site being prepared is very small. The first trial within this study is probably the most relevant to the scenario due to the second and third trials using a 'no touch' preparation kit containing iodine tincture. These kits are beginning to be used more in veterinary hospitals and practices but the disinfectants used are different. The first trial produced poor results for all the preparation methods used, in that large numbers of bacteria were yielded post disinfection and so no relevant evidence can be gained from this.

The veterinary study found is taken from a veterinary nurse undergraduate dissertation published in a veterinary nursing publication. Although it is very relevant to the PICO the sample size is too small to find a significant difference between the two techniques.

Summary of the evidence

McDonald (2001) Evaluation of donor arm disinfection techniques	
Population:	Trial no 1 – Routine blood donors Trial no 2 – Blood donation staff Trial no 3 – Routine blood donors
Sample size:	Trial no 1 – 314 donors Trial no 2 – 198 staff Trial no 3 – 300 donors
Intervention details:	<p>Trial 1 - 3 methods of donor arm disinfection were adapted from donation centres.</p> <p>The sample size was split into 3 groups according to the 3 disinfection techniques.</p> <p>Pre disinfection swabs were taken from each arm.</p> <p>One technique involved using the circular motion the second was the same as the first but the technique was carried out twice and the third involved wiping either side of the vein once then over the vein. Low bacterial reductions were gained from these techniques and so none were adopted for the rest of the study.</p> <p>Trial 2: A second trial was carried out with seven techniques. The two best performing techniques at reducing bacterial levels from the second trial were chosen for the third trial. These were applying iodine tincture (commercial, no touch kit) using the back and forth motion and the second was two applications of alcohol using back and forth motion followed by the application of iodine tincture (commercial, no touch kit) in a circular motion.</p> <p>Trial 3: The methods were selected as above with the addition of a control method consisting of CHX and IPA wipe being used in a circular motion before being allowed to dry. The commercial kit used in the other preparation methods consisted of a device designed so that the hands of the operator are nowhere near the skin at the time of using it thus making it 'no touch' technique. There were 100 participants in each of these groups.</p>
Study design:	Prospective trial
Outcome studied:	Post disinfection bacterial counts at the donation site, in this case the antecubital fossa of the arm.
Main findings: (relevant to PICO question):	<p>The first trial was mainly to find a technique which they could take forward into further trials. The methods adapted are discussed in the intervention details section. Results found that low bacterial reductions were gained from these techniques and so none were adopted for the rest of the study.</p> <p>In the second trial the technique that involved using an up and down</p>

	<p>motion with a commercial kit (after initial application of IPA) was found to be most effective although not significant</p> <p>In the 3rd trial, the technique using the up and down motion using the commercial 'no touch' kit was found to be superior ($p < 0.001$) to the method that applied the tincture of iodine in a spiral method. However, the absence of confidence intervals makes statistical reporting poor and there can be some question about whether a difference in bacterial reductions of 1.64% can be called significant.</p>
<p>Limitations:</p>	<ul style="list-style-type: none"> • This is carried out on humans not animals. • There was no indication that those who were collecting the swabs for bacterial counts were blinded to the methods used. • It is only carried out on one small area of skin, which due to location may not be exposed to high bacterial counts in the first place. • It wasn't the same person carrying out all the arm disinfections and people's technique may differ slightly. • A commercial 'no touch' kit was used. Although such kits are available to veterinary practices, patients are often prepped for surgery with swabs held by gloved or sometimes non gloved hands rather than the 'no touch' method. • The 'no touch' kit methods included the use of iodine rather than CHX and so cannot be transferred to veterinary practice where CHX is used the majority of the time.
<p>Swales (2017) Failure to achieve asepsis following surgical skin preparation is influenced by bacterial resistance to Chlorhexidine, but not skin preparation technique</p>	
<p>Population:</p>	<p>Client owned dogs admitted to a university teaching hospital for abdominal surgery.</p>
<p>Sample size:</p>	<p>25 dogs</p>
<p>Intervention details:</p>	<p>The dogs were clipped from the thoracic outlet to the pubic symphysis and to lateral skin edges.</p> <p>Post preparation swabs were taken before any product was applied to the skin.</p> <p>The patient was then prepared for surgery using one of two methods, either the concentric circle method or the linear (back and forth or friction) method using a 2% Chlorhexidine (CHX) solution. The methods were alternated and carried out by the same person each time. There were 13 dogs who were prepared using the back and forth method and 12 who had concentric circles</p>

	<p>The patients were prepped for five minutes or until a plain swab wiped over the surgical incision site came away clean. Another swab was taken after preparation.</p> <p>The swabs were cultured on mannitol salt agar or MacConkey Agar and these were incubated for 24 hours.</p> <p>Colonies found from the post preparation swabs were subcultured into blood culture bottles for identification of bacterial species.</p>
Study design:	Prospective trial
Outcome studied:	Whether reduction in bacterial count differed between the two scrub methods.
Main findings: (relevant to PICO question):	<p>Both methods significantly decreased bacterial counts on the skin but there was no significant difference in the post preparation bacterial counts between the two methods.</p> <p>32% of the dogs had bacteria present after skin preparation, 8 dogs in total but two had two species present. Three were prepared using concentric circles and five using the linear method. 4 out of the 10 species of bacteria present were resistant to CHX at the dilutions tested. There was no significance between the groups of the likeliness of bacteria remaining.</p> <p>Due to the lack of significance between the 2 methods and with the fact that some bacteria were resistant to CHX, the authors concluded that resistance may be more of an issue with products used for patient preparation rather than the method in which they are applied</p>
Limitations:	<ul style="list-style-type: none"> • Small sample size, probably due to the limited data collection window. • The subjectivity of when preparation was deemed finished, by either timing for 5 minutes or until a clean dry swab came away from the skin clean • The patients were all dogs but sizes, lifestyle and coat may have differed greatly, meaning that some may have had a higher bacterial burden on the skin. The study method states that no exclusions were made due to age, breed or sex.

Appraisal, application and reflection

One human study was found to be relevant to the PICO which reports superior action of the up and down

friction method compared with the circular technique, however, results may be confounded by the use of different products; it is unclear whether the treatment effect was due to the scrub technique or the disinfectant applied. The main limitation to this study is its application in the veterinary world due to the nature and site of the areas being prepared in the human study.

The veterinary study found is taken from a veterinary nurse undergraduate dissertation published in a veterinary nursing publication. Although the study is very good, the sample size is small and the study likely to be underpowered, meaning that due to it not being a true representation of a population it may miss out on a significant result. It is not known whether a significant difference may be found with a larger sample size, as there are no similar studies carried out in this area. There is still a gap in the evidence for a larger scale veterinary study to be carried out in this area which could provide some usable evidence through controlling aspects such as species, type of disinfection used, contact time and method of application.

Not every clinical decision made comes down to only evidence. Based on experience and opinion it may be argued that the circular method a) doesn't thoroughly disinfect the proposed incision site and b) risks bringing bacteria from the periphery back over the proposed incision site before the swab is discarded. The back and forth method could produce more friction, and it is this mechanical action which could help to reduce bacterial levels on the skin (Davids et al 2015). However, in the absence of evidence, protocol should be made based on what works best for the practice and has proven to be most efficient and achieves the best results.

Methodology Section

Search Strategy	
Databases searched and dates covered:	CAB abstracts 1973-2017 Week 26 PubMed
Search terms:	<p>CAB abstracts:</p> <ol style="list-style-type: none"> 1. (preoperative or pre-operative or presurgery or presurgical or pre-surgery or pre-surgical) 2. ((site or skin) and (technique or techniques or method or methods or preparation)) 3. ((scrub or scrubs or scrubbing) and (technique or techniques or method or methods or preparation)) 4. 1 and (2 or 3) <p>PubMed:</p> <p>((preoperative or pre-operative or presurgery or presurgical or pre-surgery or pre-surgical)) AND ((site or skin) AND (technique or techniques or method or methods or preparation)) AND ((scrub or scrubs or scrubbing) AND (technique or techniques or method or methods or preparation))</p>
Dates searches performed:	13/07/2017

Exclusion / Inclusion Criteria	
Exclusion:	Review articles
Inclusion:	Those relevant to PICO including human literature

Search Outcome					
Database	Number of results	Excluded – not relevant to PICO	Excluded – Review article	Excluded – due to methodology	Total relevant papers
CAB abstracts	203	202		1	0
PubMed	129	129			0
Hand search	3		1		2
Total relevant papers when duplicates removed					2

CONFLICT OF INTEREST

The author declares no conflict of interest.

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